

REMARKS**Amendments to the Claims**

Claims 23-25, 29, 30, 32-34 and 44-47 are pending in this application. Claims 23 and 44 are currently amended. Claims 45-47 are new. No new matter has been added. Support for new claims can be found, for example, in the published application at paragraphs 17, 35, 36 and 52, Table 1, and claims as original claims. Claims 1-22, 26-28, 31 and 35-43 are canceled.

The Examiner has rejected claims 23-25, 29, 30, 32-34 and 44.

Claim Rejections Under 35 U.S.C. § 102/35 U.S.C. § 103

Claim 23 has been rejected under 35 U.S.C. §102(b) as allegedly being anticipated by Jochum et al. (U.S. Pat. No. 5,100,929). The Examiner states that Jochum et al. disclose dental compositions comprising thiol-enes and a photoinitiator and filler wherein the compositions contain at least 10% by weight polythiol compound (column 2, line 33, to column 3, line 19). The Applicants have amended claim 23, in part due to address the Examiner's concerns, and respectfully traverse this rejection.

Jochum et al. teach photopolymerizable dental compositions curable with visible light which, in order to obtain a curing free from any smeary layer, contain at least 10% by weight poly-thiol compound(s), at least 10% by weight poly-ene compound(s) and 0.01 to 5% by weight of at least one acyl phosphine compound as photoinitiator. Abstract.

Instant amended claim 23 does not claim use of an acyl phosphine compound as a visible light initiator. Amended claim 23 teaches photopolymerizable dental restorative materials comprising filler; first monomers having thiol functional groups; second monomers having vinyl functional groups; and an initiator selected from camphorquinone and 2,2-dimethoxy-2-phenylacetophenone; wherein at least about 10% of the functional groups in the dental restorative material are thiol functional groups. The instant specification and claims encompass both visible-light and ultraviolet-photoinitiation. Camphorquinone, with or without amine accelerator ethyl 4-(dimethylamino)benzoate (EDAB), is exemplified in the instant specification as a visible-light photoinitiator; while 2,2-dimethoxy-2-phenylacetophenone (DMPA) is utilized

as a UV-photoinitiator. Support for the amendment is found in the instant published application, for example, at paragraphs 18, 35, 44, 47, 49, 52, 59 and Table 1.

Jochum et al. do not teach use of either uv-photoinitiation or 2,2-dimethoxy-2-phenylacetophenone as an initiator. Jochum et al. teach only the use of acyl phosphine oxide visible light photoinitiators with thiol-ene systems. In the way of background, Jochum et al. teach that attempts to use combinations of campher quinone and acyl phosphine oxide visible light initiators, used with tertiary amines, were unsuccessful:

So far, all the attempts to transfer the steps described above contributing to a reduction of the smeary layer in UV-curing compositions to the field of compositions which can be cured with visible light (>400 nm) were unsuccessful. For instance, with combinations of photoinitiators responsive to visible light, for example campher quinone and acyl phosphine oxides, with tertiary amines photopolymerizable compositions are obtained which, although they can be cured with visible light, after the curing due to oxygen inhibition have a pronounced layer of smear...

Emphasis added. Column 2, lines 9-19.

The term "smeary layer", which is to be avoided in dental compositions cured with visible light as taught by Jochum et al., refers to an uncured layer at the surface of the polymer, caused by oxygen inhibition.

In contrast, oxygen inhibition is not seen in the photopolymerized compositions of the instant application. The instant application teaches compositions comprising thiol and ene monomers with camphorquinone as photoinitiator, with or without an amine accelerator, which cure upon exposure to visible light without oxygen inhibition. See, for example, the abstract, and paragraphs 17, 36, and 49. Further, the instant specification teaches thiol-ene systems can be initiated by camphorquinone under visible light irradiation, without the presence of the amine accelerator. Therefore, Jochum et al. do not teach each and every aspect of amended claim 23. In light of the amendment to claim 23, and the arguments presented above, the Examiner is respectfully requested to reconsider this rejection.

The Examiner has rejected claims 24, 25, 29, 30, 32-34 under 35 U.S.C. § 102(b) as allegedly anticipated by or, in the alternative, under 35 U.S.C. § 103(a), as obvious over Jochum et al. With respect to claims 24 and 25, the Examiner states that Jochum et al. do not specifically

disclose the recited percentage ranges of thiol functional groups. The Examiner comments that with respect to claims 29, 30 and 32-34, Jochum et al. do not mention the specified properties recited. However, the Examiner continues, since the compositions disclosed by Jochum et al. comprise the same components as are set forth in instant claim 23, the instantly claimed properties are expected to be inherent to the prior art polymerized products, in the absence of evidence to the contrary.

Claim 23 has been amended, which affects the scope of claims dependent thereupon. The Applicants traverse the rejections under 35 U.S.C. § 102(b) and under 35 U.S.C. § 103(a) over Jochum et al.

Jochum et al. do not disclose each and every aspect of amended claim 23 or dependent claims 24, 25, 29, 30, 32-34; and therefore do not anticipate the claims under 35 U.S.C. § 102(b), as discussed above.

Jochum et al. also do not teach or suggest amended claim 23 or dependent claims 24, 25, 29, 30, 32-34; and therefore the claims are not rendered obvious under 35 U.S.C. § 103. In fact, Jochum et al. teach away from the use of camphorquinone in thiol-ene compositions cured with visible light.

As stated above, Jochum et al. teach photopolymerizable dental compositions curable with visible light which, in order to obtain a curing free from any smeary layer, contain at least 10% by weight poly-thiol compound(s), at least 10% by weight poly-ene compound(s) and 0.01 to 5% by weight of at least one acyl phosphine compound as photoinitiator. Abstract. Jochum et al. teach only the use of acyl phosphine oxide visible light photoinitiators with thiol-ene systems.

Jochum et al. teach that attempts to use combinations of campher quinone and acyl phosphine oxide visible light initiators, used with tertiary amines, were unsuccessful and resulted in an unacceptable smeary layer. See the quoted lines above from Jochum et al. Column 2, lines 9-19. The term "smeary layer" refers to an uncured layer at the surface of the polymer, caused by oxygen inhibition. Therefore, upon review of Jochum et al., one of ordinary skill in the art would not be motivated to try use of camphorquinone as a visible light photoinitiator in thiol-ene systems in photopolymerizable dental restorative materials.

In contrast, oxygen inhibition is not seen in the photopolymerized compositions of the instant application. The instant application teaches compositions comprising thiol and ene monomers with camphorquinone as photoinitiator, with or without an amine accelerator, which cure upon exposure to visible light without oxygen inhibition. See, for example, the abstract, and paragraphs 17, 36, and 49. Further, the instant specification teaches thiol-ene systems can be initiated by camphorquinone under visible light irradiation, with or without the presence of the amine accelerator. Therefore, Jochum et al. do not teach or suggest, thus do not render obvious, the claimed subject matter of amended claim 23, or claims dependent thereupon. In light of the amendments, and the arguments presented above, the Examiner is respectfully requested to reconsider this rejection.

Claim 44 has been rejected under 35 U.S.C. §103(a) as allegedly obvious over Jochum et al. alone or in view of Rheinberger et al. (U.S. Pat. No. 5,889,132). The Examiner states Jochum et al. teach that camphorquinone and acyl phosphine oxides are known as initiators responsive to visible light for polymerizing dental compositions. The Examiner explains Rheinberger et al. disclose thiolene dental compositions and photoinitiators therefor, including camphorquinone and acyl phosphine oxides (column 28, lines 39-50). According to the Examiner, it would have been obvious to one skilled in the art at the time of the invention to substitute camphorquinone for the acyl phosphine oxide photoinitiator in the compositions disclosed by Jochum et al. The Examiner concludes that one skilled in the art at the time of the invention would have been motivated by a reasonable expectation of successfully photoinitiating polymerization of the thiol-ene dental compositions taught by Jochum et al., as taught by Rheinberger et al. in analogous dental compositions.

The Applicants respectfully traverse the rejection of Claim 44 under 35 U.S.C. §103(a) over Jochum et al. alone or in view of Rheinberger et al. (U.S. Pat. No. 5,889,132). Nonetheless, claim 44 has been amended to recite as discussed above.

Rheinberger et al. teach a dental material comprising a silicic acid condensate of a hydrolysable and polymerisable norbornene silane or a silicic acid condensate of a hydrolysable and polymerisable mercaptosilane together with a reactant for a thiol-ene polymerisation. For

example, according to Rheinburger et al. a particularly preferred dental material according to the invention contains:

- (a) 5 to 80, in particular 10 to 60 wt. %, of silicic acid condensate of the norbornene silane (Ia) or the mercaptosilane (Ib), and
- (b) 0 to 50, in particular 0 to 30 wt. %, of further hydrolytically condensable compounds, optionally in the form of condensates,
- (c) 5 to 80, in particular 20-70 wt. %, of reactants for thiol-ene polymerisation,
- (d) 0.1 to 5, in particular 0.2. to 2 wt. %, of polymerisation initiators, and/or
- (e) 0 to 90 wt. %, in particular 0 to 80 wt. %, of fillers.

Emphasis added. Col. 29, line 1-11.

Further, Rheinburger et al. teach:

The thiol-ene polymerisation of the dental material according to the invention leads to the addition of thiol groups of one component to C=C double bonds of the other component, and inorganic-organic composite materials having a high mechanical hardness and strength, which is superior to that of conventional ene-thiol polymerisates, form as reaction products.

Rheinberger et al. teach that only soft materials with elastic or viscoelastic properties can be obtained with the conventional thiol-ene polymerization systems. See, for example, Column 2, lines 27-30. Rheinberger et al. therefore teach away from conventional thiol-ene polymerization systems. One of ordinary skill in the art would not be motivated to combine the teachings of Rheinburger et al., with the more conventional thiol-ene system of Jochum et al., without use of the silicic acid condensates, since resultant polymers would not have the requisite hardness. Jochum et al. teach away from the use of camphorquinone as discussed above, and the teaching away of Jochum et al. is not overcome by the Rheinberger et al. reference. In light of the amendments, and the arguments presented above, the Examiner is respectfully requested to reconsider this rejection.

The foregoing amendments are made solely to expedite prosecution of the application and are not intended to limit the scope of the invention. Further, the amendments to the claims are made without prejudice to the pending or now canceled claims or to any subject matter

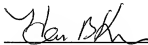
pursued in a related application. The Applicant reserves the right to prosecute any canceled subject matter at a later time or in a later filed divisional, continuation, or continuation-in-part application.

The foregoing is submitted as a complete response to the Office action identified above. The Applicants respectfully submit that the present application is in condition for allowance and solicit a notice to the effect. If the Examiner believes a telephone conference would advance the prosecution of this application, the Examiner is invited to telephone the undersigned at the below-listed telephone number.

It is believed that no fees are due with this submission. However, the Commissioner is hereby authorized to charge any deficiencies or credit any overpayment with respect to this patent application to deposit account number 13-2725.

Respectfully submitted,

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